

# Communication Earplug Approved for Naval Aviator Use

By Valerie Bjorn and Jim Wilt

*Approach* Mar-Apr 2004 highlighted Naval Aviation noise hazards: why it's a good idea to report radio comm problems, and the need for better hearing protection and speech communication gear. This article is about a new communication earplug called Mini-CEP that Naval Air Systems Command developed through a Small Business Innovation Research (SBIR) Program endorsed by the Joint Strike Fighter, AH-1Z, and UH-1N Cobra programs.

## Things You Should Know About Noise and Your Hearing

- You shouldn't be exposed to noise above 85 dB for more than 8 hours a day. Exposure to noise (8 hrs.) should be followed by 16 hours of quiet recovery time.
  - External Naval jet aircraft noise ranges from 130 to 150 dB (measured 50 ft from aircraft, 45 degrees off the nose).
  - Cockpit noise in jet aircraft ranges from 115 to 130 dB.
  - Today's double protection of earplugs and earcups provides approximately 30 dB of attenuation.
  - There are few quiet spaces (below 85 dB) on an aircraft carrier for hearing to recover.
- Most Fleet earplugs and earcups are nearly the same design worn 30 to 50 years ago.
- The No. 1 most prevalent Veteran Administration disability claim is hearing loss. All services combined, claims totaled over \$633 million in 2004, over \$6.7 billion since 1977, and the trend is upward.
- Navy jet-noise-induced hearing loss generally starts in the frequencies you need to hear speech. Your ability to discriminate consonants, as opposed to vowels, goes first. Loss of the ability to discriminate between consonant sounds like "s" and "f" make it more difficult to understand what is being communicated.

**Comm Goes Both Ways** -- When you think about radio comm quality, you need to think in terms of “the talker” and “the listener.” Noise getting into the comm system at either or both ends, coupled with any hearing loss at either or both ends, increases the chance for missed calls, misinterpretations, and mishaps. Anything that can be done to reduce or block undesirable noise from getting into the comm system and to protect against hearing loss will make Naval Aviation that much safer and efficient.

**Double Protection** -- DoD wide, earplugs worn along with earcups (as earmuffs or in a helmet) are required for hearing conservation in high-noise environments above 104 dB. Unfortunately, the addition of earplugs under helmet earcups decreases the ability to communicate since the earplugs attenuate speech signals from the earcup earphones at the same time as they attenuate undesirable noises coming in from outside the earcups. A new earplug is now available to help fix this problem.

**Mini-CEP Reduces Undesirable Noise while Channeling Thru Speech Sounds** -- The Mini-CEP was developed under the Navy’s Small Business Innovation Research Program (SBIR) by improving upon an Army communications earplug, CEP. The Mini-CEP is smaller, more comfortable, and more rugged. These devices provide the hearing protection of an expanding foam earplug while passing the clearest speech signal attainable in to the ear canal. The Mini-CEP consists of a miniature receiver encapsulated in a plastic



housing that screws in to a semi-rigid threaded hollow core that’s glued inside a replaceable earplug. The speech signal is delivered directly from the receiver into the occluded portion of the ear canal. When properly inserted into the ear canal, the Mini-CEP transducer fits completely inside the external ear. The small wires used to connect the Mini-CEP to the communications system are highly flexible for comfort and small enough to minimize the potential for noise leaks as they route between the earcup cushion and the user’s head.

**Mini-CEP Performance in the Lab and in the Fleet** -- Naval Air Systems Command leveraged Army CEP studies and sponsored additional laboratory and environmental tests to ensure the Mini-CEP was ready for operational flight testing and fielding. The Mini-CEP integrates safely with helo, prop, and jet helmets, comm and life support systems, and emergency egress procedures such as ejection. The composite noise attenuation and speech intelligibility of the Mini-CEP and aviator helmet rivals that of more costly Active Noise Reduction (ANR) headsets but without the added weight and



system complexity. Additionally, when ancillary devices such as spectacles or chemical and biological protective masks are worn, Mini-CEP sound attenuation and speech intelligibility is significantly greater than when standard and ANR headset are worn alone. This is because items such as these interfere with the seal of the earcup against the head and thus allow a noise leak pathway – this is not a problem for earplugs.

Laboratory testing showed the Mini-CEP provides about 30 dB of noise attenuation when worn alone. When worn under a helmet with earcups, Mini-CEPs add an additional 10 dB noise attenuation (average) to the helmet/earcup attenuation.

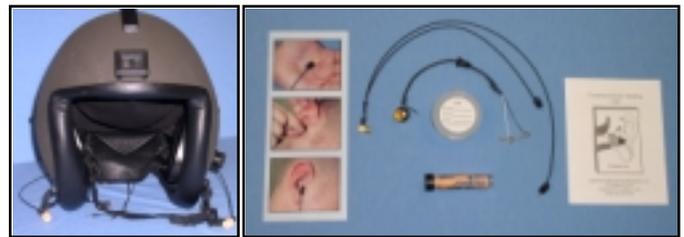
Fleet rotary, prop, and jet crews who flight tested the Mini-CEP all reported reduced noise levels and increased speech clarity compared to their experience wearing regular aviator helmets alone.

**Logistics Tail** The Mini-CEP requires no aircraft modification. Mini-CEPs are integrated into the existing rotary and fixed wing helmets and add <1oz. to the helmet. The Mini-CEP mod kits cost about \$120 each and include assorted earplug sizes and fitting instructions. Training manuals and videos are also available. The Mini-CEP comm is wired in parallel with the existing helmet communication system, which continues to work even if the Mini-CEP fails.

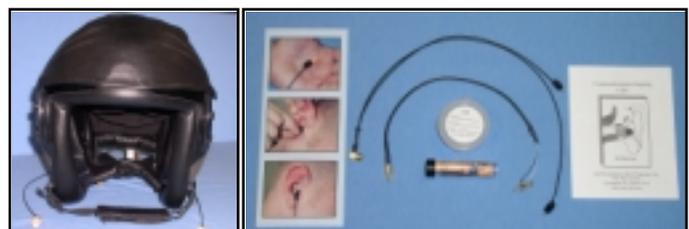
## Mini-CEP Comments from the Fleet

*(Testing by VS-31, MAG-11, MAG-39,  
MAWTS-1, VFA-122, and VX-23)*

- ✓ Radio/ICS thru Mini-CEP was “incredibly clear”
- ✓ Reduced volume levels for radio/ICS
- ✓ Significant reduction in ambient noise
- ✓ “Excellent noise attenuation in all parts of the envelope”



**HGU-84/P Helo Helmet with Mini-CEP Mod**  
CEP104-K04E Kit includes the  
Mini-CEP (CEP402-C05)  
Helmet Interface (CEP900-I04E)  
Mixed size eartips (CEP300-EMXP)  
Use and Fitting Guide



**HGU-68/P Tactical Helmet with Mini-CEP Mod**  
CEPB03-K03E Kit includes the  
Mini-CEP (CEP402-C05)  
Helmet Interface (CEP403-I03E)  
Mixed Size Eartips (CEP300-EMXP)  
User and Fitting Guide

Ms. Bjorn and Mr. Wilt are with Naval Air Systems Command.

## UPDATE: FLIGHT DECK HEARING PROTECTION

Naval Air Systems Command (NAVAIR) is completing certification testing for Mini-CEP use on the flight deck.

NAVAIR is also leading several efforts to re-design the flight deck cranial helmet. We'd like your input on the design. To participate in our survey, go to

<https://pma202.navair.navy.mil>

JOIN / LOGIN

Team Sites

Science and Technology

Environmental & Hearing  
Protection Survey

Flight Deck/Line Cranial Re-  
Design

Or call

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BjornVS, WiltJK. Can You Hear Me Now. *Approach*, The Naval Safety Center's Aviation Magazine, Mar-Apr04: pp 17-18.

Lead Photo: 041226-N-2984R-105 Persian Gulf (Dec. 26, 2004) - Landing Signal Officers (LSO) recover an F-14B Tomcat during evening flight operations aboard the Nimitz-class aircraft carrier USS Harry S. Truman (CVN 75). Embarked Carrier Air Wing Three (CVW-3) is providing close air support and conducting intelligence, surveillance, and reconnaissance missions over Iraq. The Truman Strike Group and CVW-3 are on a regularly scheduled deployment in support of the Global War on Terrorism. U.S. Navy photo by Photographer's Mate Airman Apprentice Ricardo J. Reyes (RELEASED)

021217-N-4374S-014 Atlantic Ocean (Dec. 17, 2002) -- Aircrew Survival Equipmentman 1st Class David Cummings, assigned to "Vanguards" of Helicopter Mine Countermeasure Squadron Fourteen (HM-14),

## *Analyst's Note:*

**The Mini-CEP has only recently been authorized for use. The change authorizing it for use is IRAC 20 to NAVAIR 13-1-6.7-3 (NAVAIR MSG 171923Z MAR 05). This message provides the ordering information your PRs need to get this new earplug for you. If you need a copy of the message, check the NavAir State of the Art Survival Items webpage, under "Messages 2005." For more information, contact your local aeromedical safety officer (AMSO). – Lt. Greg Ostrander, aeromedical analyst at the Naval Safety Center.**

## References

communicates with the pilots aboard the MH-53E "Sea Dragon" helicopter en route to the aircraft carrier USS Theodore Roosevelt (CVN 71). "Sea Dragons" are capable of transporting up to 55 troops and towing a variety of mine-countermeasures systems as their primary mission. U.S. Navy photo by Photographer's Mate 2nd Class Michael Sandberg. (RELEASED)

VA data is available at <http://dhppm-www.apgea.army.mil/hcp/default.aspx>, click "Compensation Reports"

Safe noise exposure and hearing conservation instructions can be located online

- OPNAVINST 5100.23 Navy Occupational Safety and Health Program Manual
- NAVMEDCOMINST 6260.5 Occupational Noise Control & Hearing Conservation
- DoD Instr 6055.12 Hearing Conservation Program

Mozo, B.T. and Murphy, B.A. 1997a. The assessment of sound attenuation and

speech intelligibility of selected active noise reduction devices and the communications earplug when used with the HGU-56/P aviator helmet. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL Report No. 97-08.

Mozo, B.T. and Murphy, B.A. 1997b. Evaluation of the communications earplug in the H-53 and CH-46 helicopter environments. Fort Rucker, AL: U.S. Army Aeromedical Research Laboratory. USAARL Report No. 97-36.

Denihan, M.B., Thames, W.  
NAWCADPAX/RTR-2004/XX (in review)  
Evaluation of the Communications Earplug and Hush Kit Combination in the F/A-18 Aircraft.

050126-N-5781F-031 Pacific Ocean (Jan. 26, 2005) – Safety Checkers gives the okay to launch an F/A-18C Hornet off the flight deck of USS Kitty Hawk (CV 63). Currently under way in the 7th Fleet area of responsibility (AOR), Kitty Hawk demonstrates power projection and sea control as the U.S. Navy's only permanently forward-deployed aircraft carrier, operating from Yokosuka, Japan. U.S. Navy photo by Photographer's mate 3rd Class Bo J. Flannigan (RELEASED)